We claim:

1. An isolated DC-DC converter for use with a DC power source having a DC voltage across a first voltage source output and a second voltage source output and with a load, the converter comprising:

a. an input for accepting the DC voltage, the input having a first voltage input and a second voltage input,

b. an output for outputting a converted DC voltage, the output having a first voltage output and a second voltage output,

c. a primary side circuit connected between the first voltage input and the second voltage input including a first primary winding of a first transformer and an auxiliary section,

d. a plurality of rectifier circuits, each rectifier circuit having a separate secondary winding of the first transformer, the rectifier circuits connected in parallel with one another and with the output, and

e. an output capacitor connected between the first voltage output and the second voltage output and across the rectifier circuit

wherein an output converted DC voltage between the first voltage output and the second voltage output has the same polarity as a DC voltage input between the first voltage input and the second voltage input,

wherein the auxiliary section is for causing the first transformer to transfer power from the first primary winding to the first secondary winding and to operate without saturation,

wherein the rectifier circuit is for converting output of the first secondary winding into a one-direction waveform and converting the one-direction waveform into a DC voltage, and

wherein the output capacitor is for filtering the converted DC voltage.

2. The converter of claim 1, wherein the plurality of rectifier circuits comprises only first and second rectifier circuits.

3. An isolated DC-DC converter for use with a DC power source having a DC voltage across a first voltage source output and a second voltage source output and with a load, the converter comprising:

a. an input for accepting the DC voltage with, the input having a first voltage input and a second voltage input,

b. an output for outputting a converted DC voltage, the output having a first voltage output and a second voltage output,

c. a primary side circuit connected between the first voltage input and the second voltage input including a primary winding of each of a plurality of transformers, and an auxiliary section,

d. a rectifier circuit having a secondary winding for each of the plurality of transformers, the rectifier circuit connected in parallel with the output, and

e. an output capacitor connected between the first voltage output and the second voltage output and across the rectifier circuit,

wherein an output converter DC voltage between the first voltage output and the second voltage output has the same polarity as a DC voltage input between the first voltage input and the second voltage input,

wherein the auxiliary section is for causing the transformers to transfer power from the primary windings to the secondary windings and to operate without saturation, and the auxiliary section includes switches for repeatedly connecting and disconnecting the primary windings from the input, and for resetting the transformers, wherein a plurality of the switches in the auxiliary section are shared between transformers,

wherein the rectifier circuit is for converting output of the secondary windings into a one direction waveform and converting the one-direction waveform into a DC voltage, and

wherein the output capacitor is for filtering the converted DC voltage.

4. The converter of claim 3, wherein the rectifier circuit further comprises a plurality of switches for performing the conversion of output of the secondary windings into a one-direction waveform, and wherein a plurality of the switches of the rectifier circuit are shared between the secondary windings of the transformers.

5. The converter of claim 3, wherein the transformer primary windings of the plurality of transformers are connected one to the next in a ring.

6. The converter of claim 4, wherein the transformer primary windings of the plurality of transformers are connected one to the next in a ring.

7. An isolated DC-DC converter for use with a DC power source having a DC voltage across a first voltage source output and a second voltage source output and with a load, the converter comprising:

a. an input for accepting the DC voltage, the input having a first voltage input and a second voltage input,

b. an output for outputting a converted DC voltage, the output having a first voltage output and a second voltage output,

c. a primary side circuit connected between the first voltage input and the second voltage input including a primary winding of each of a plurality of transformers, and an auxiliary section,

d. a rectifier circuit having a secondary winding for each of the plurality of transformers, the rectifier circuit connected in parallel with the output, and

e. an output capacitor connected between the first voltage output and the second voltage output and across the rectifier circuit,

wherein an output converted DC voltage between the first voltage output and the second voltage output has the same polarity as a DC voltage input between the first voltage input and the second voltage input,

wherein the auxiliary section is for causing the transformers to transfer power from the primary windings to the secondary windings and to operate without saturation, and the auxiliary section includes a combination of switches and capacitors for repeatedly connecting and disconnecting the primary windings from the input, and for resetting the transformers,

wherein the combination of switches and capacitors in the auxiliary section is shared between transformers,

wherein the rectifier circuit is for converting output of the secondary windings into a one-direction waveform and converting the one-direction waveform into a DC voltage, and

wherein the output capacitor is for filtering the converted DC voltage.

8. The converter of claim 7, wherein the rectifier circuit further comprises a plurality of switches for performing the conversion of the output of the secondary windings into one-direction voltage, and wherein a plurality of the switches of the rectifier circuit are shared between the secondary windings of the transformers.

9. The converter of claim 1, 3 or 7, wherein the primary switches have input for gate drive signals for operating the primary windings out of phase with one another.

10. The converter of claim 1, 3 or 7, wherein the auxiliary section comprises four switches.

11. The converter of claim 10, wherein each switch is a MOSFET.

12. The converter of claim 1, wherein the auxiliary section comprises a first switch connected between a first side of the first primary winding and the first voltage input, a second switch connected between a second side of the first primary winding and the first voltage input, a third switch connected between the first side of the first primary winding and the second voltage output, and a fourth switch connected between the second side of the first primary winding and the second voltage input.

13. The converter of claim 12, wherein each switch has an input for a gate drive signal for controlling the operation of the switch.

14. The converter of claim 13, wherein the gate drive signals repeatedly turn on and turn off the first and fourth switch, as well as turn on and turn off the second and third switch, whereby the transformer can be reset.

15. The converter of claim 1, wherein the auxiliary section comprises a first switch connected between a first side of the first primary winding and the first voltage input, a first capacitor connected between a second side of the first primary winding and the first voltage input, a second switch connected between the first side of the first primary winding and the second voltage input, and a second capacitor connected between the second side of the first primary winding and the second voltage input.

16. The converter of claim 15, wherein each switch has an input for a gate drive signal for controlling the operation of the switch.

17. The converter of claim 15, further comprising gate drive signals adapted to repeatedly turn on and turn off the first switch, and repeatedly turn on and turn off the second switch, whereby the first transformer can be reset from the capacitors.

18. The converter of claim 15, wherein the capacitors are large enough that the voltage across the capacitors will not change significantly during normaloperation of the converter.

19. The converter of claim 1, wherein the rectifier circuit further comprises a combination of inductors and switches, wherein the switches are for converting

alternating voltage in the first secondary winding into pulsating one-direction voltage and the inductors are for converting pulsating one-direction voltage into DC voltage.

20. The converter of claim 1, wherein the rectifier circuit further comprises a combination of inductors and diodes, wherein the diodes are for converting pulsating alternating voltage in the first secondary winding into pulsating one-direction voltage and the inductors are for converting pulsating one-direction voltage into DC voltage.

21. The converter of claim 3 or 7, wherein the rectifier circuit further comprises a first rectifier switch connected between the second voltage output and a first side of the first secondary winding, a second rectifier switch connected between a second side of the first secondary winding and the second voltage output, a first inductor connected between the first side of the first secondary winding and the first voltage output, and a second inductor connected between the second side of the first secondary winding and the first voltage output.

22. The converter of claim 21, wherein each switch has an input for a gate drive signal for controlling the operation of the switch.

23. The converter of claim 21, further comprising gate drive signals adapted to switch the first and second rectifier switches to convert alternating pulsating AC voltage at the first secondary winding into one direction pulsating voltage.

24. The converter of claim 3 or 7, wherein the rectifier circuit further comprises a first rectifier switch connected between the first voltage output and a first side of the first secondary winding, a second rectifier switch connected between a second side of the first secondary winding and the second voltage output, and a first inductor connected between the first side of the first secondary winding and the first voltage output not in series with the second rectifier switch.

25. The converter of claim 3 or 7, wherein the rectifier circuit further comprises first and second rectifier diodes and a first inductor, and the first diode is connected between a first side of the first secondary winding and the first inductor, and the inductor is further connected between the first diode and the first voltage output, for forward conduction from the secondary winding through the inductor, and the second diode is connected between (a) a point between the second side of the first secondary winding and the second voltage output and (b) a point between the first inductor and first diode, also for forward conduction from the secondary winding through the inductor.

26. The converter of claim 3 or 7, wherein the rectifier circuit further comprises a second secondary winding, first and second rectifier diodes and a first inductor, and a second side of the first secondary winding is connected to a first side of the second secondary winding and the second voltage output, and the first diode is connected between a first side of the first secondary winding and the first inductor, and the inductor is further connected between the first diode and the first voltage output, for forward conduction from the secondary winding through the inductor, and the second diode is connected between (a) the second side of the second secondary winding and (b) a point between the first inductor and first diode, also for forward conduction from the secondary winding through the inductor.

27. The converter of claim 3 or 7, wherein the rectifier circuit further comprises a second secondary winding, first and second rectifier switches and a first inductor, and a second side of the first secondary winding is connected to a first side of the second secondary winding and the inductor which is further connected to the first voltage output, and the first rectifier switch is connected between a first side of the first secondary winding and the second voltage output, and the second rectifier switch is connected between a second side of the second secondary winding and the second voltage output.

28. The converter of claim 20, wherein the first and second rectifier switches, the first secondary winding and the first and second inductors are comprised within a first rectifier section, and the rectifier circuit further comprises a second rectifier section similar to the first rectifier section, and the first and second rectifier sections are connected in parallel with one another and with the output capacitor and the output.

29. The converter of claim 25, wherein the first and second diodes, the first secondary and second secondary windings and the inductor are comprised within a first rectifier section, and the rectifier circuit further comprises a second rectifier section similar to the first rectifier section, and the first and second rectifier sections are connected in parallel with one another and with the output capacitor and the output.

30. The converter of claim 26, wherein the first and second rectifier switches, the first secondary and second secondary windings and the inductor are comprised within a first rectifier section, and the rectifier circuit further comprises a second rectifier section similar to the first rectifier section, and the first and second rectifier sections are connected in parallel with one another and with the output capacitor and the output.

31. The converter of claim 3, wherein the plurality of transformers consists of a first and a second transformer and wherein the primary side primary windings consist of a first primary winding of the first transformer and a second primary winding of the second transformer, and the plurality of switches of the auxiliary section consist of a first switch connected between a first side of the first primary winding and the first voltage input, a second switch connected between a second side of the first primary winding and the first voltage input , a third switch connected between the first side of the first primary winding and the second voltage input, and a fourth switch connected between the second side of the first primary winding and the second voltage input, and a fifth switch connected between the first voltage input and a first side of the second primary winding, and a sixth switch connected between the first side of the second primary winding and the second voltage input, and a second side of the second primary is connected to a side of the first primary winding.

32. The converter of claim 31, wherein the second primary switches have inputs for gate drive signals for operating the second primary winding out of phase with the first primary winding.

33. The converter of claim 3, wherein the plurality of transformers consists of a first, second, and third transformer and wherein the primary side primary windings consist of a first primary winding of the first transformer and a second primary winding of the second transformer and a third primary winding of the third transformer, and the plurality of switches of the auxiliary section consist of a first switch connected between a first side of the first primary winding and the first voltage input, a second switch connected between a second side of the first primary winding and the first voltage input, a third switch connected between the first side of the first primary winding and the second voltage input, and a fourth switch connected between the second side of the first primary winding and the second voltage input, and a fifth switch connected between the first voltage input and a second side of the second primary winding, and a sixth switch connected between the second side of the second primary winding and the second voltage input, and a first side of the second primary winding is connected to a first side of the first primary winding, the third transformer connected between the first side of the first primary winding and the second side of the second primary winding.

34. The converter of claim 3, wherein the plurality of transformers consists of a first, second, and third transformer and wherein the primary side primary windings consist

of a first primary winding of the first transformer and a second primary winding of the second transformer and a third primary winding of the third transformer, and the plurality of switches of the auxiliary section consist of a first switch connected between a first side of the first primary winding and the first voltage input, a second switch connected between a second side of the first primary winding and the first voltage input, a third switch connected between the first side of the first primary winding and the second voltage input, and a fourth switch connected between the second side of the first primary winding and the second voltage input, and a fifth switch connected between the first voltage input and a second side of the second primary winding, and a sixth switch connected between the second side of the second primary winding and the second voltage input, and a first side of the second primary winding is connected to a second side of the first primary winding, a first side of the third primary winding connected to the second side of the second primary winding, and a seventh switch connected between a second side of the third primary winding and the first voltage input, and an eighth switch connected between the second side of the third primary winding and the second voltage input.

35. The converter of claim 34, wherein the primary switches have inputs for gate drive signals for operating the primary windings out of phase with one another, and no additional drive components are added for the third primary.

36. The converter of claim 1, 3 or 7, wherein the input voltage is approximately 48 volts DC, and the output voltage is within a range of 0.8 volts DC to 1.6 volts DC.

37. The converter of claim 1, 3 or 7, wherein the input voltage is approximately 48 volts DC, and the output voltage is approximately 24 volts DC.

38. The converter of claim 1, 3 or 7, wherein the input voltage is approximately 48 volts DC, and the output voltage is approximately 12 volts DC.

39. The converter of claim 1, 3 or 7, wherein the input voltage is approximately 400 volts DC, and the output voltage is approximately 48 volts DC.

40. The converter of claim 1, 3 or 7, wherein the input voltage is approximately 48 volts DC, and the output voltage is within a range of 0.8 volts DC to 5 volts DC.

41. The converter of claim 1, wherein the duty cycle of the transformer is between 40% and 60%.

42. The converter of claim 1, wherein the duty cycle of the transformer is approximately 50%.

43. The converter of claim 3 or 7, wherein the converter has only two transformers, and the duty cycle of each transformer is between 40% and 60%.

44. The converter of claim 3 or 7, wherein the converter has only two transformers, and the duty cycle of each transformer is approximately 50%.

45. The converter of claim 3 or 7, wherein the converter has only three transformers, and the duty cycle of each transformer is approximately 33-1/3%.

46. The converter of claim 1 wherein the first input is for accepting a DC potential that is positive when compared to a DC potential for acceptance by the second voltage input.

47. A method for operating a converter of claim 1, 3 or 7 comprising the steps of:

driving the auxiliary section to cause the first transformer to transfer power from the first primary winding to the first secondary winding,

while at the same time driving the auxiliary section to cause the transformer to operate without saturation.